TORQ Analysis of Commercial and Industrial Designers to Electronics Engineers, Except Computer

INPUT SECTION:

Transfer	Title	O*NET	Filters		
From Title:	Commercial and Industrial Designers	27-1021.00	Abilities:	Importance LeveL: 50	Weight: 1
To Title:	Electronics Engineers, Except Computer	17-2072.00	Skills:	Importance LeveL: 69	Weight: 1
Labor Market Area:	Maine Statewide		Knowledge:	Importance Level: 69	Weight: 1

OUTPUT SECTION:

Grand TORQ: 87

Ability TORQ	Skills TORQ	Knowledge TORQ
Level 92	Level 80	Level 89

Gaps To Narrow if Possible

Ability	Level	Gap	Impt
Perceptual Speed	46	11	53
Finger Dexterity	51	10	53
Deductive Reasoning	62	7	65
Oral Comprehension	64	7	62
Written Comprehension	64	7	62
Oral Expression	64	7	62
Selective Attention	42	5	56
Flexibility of Closure	44	5	53
Visualization	55	4	56
Visual Color Discrimination	48	4	53
Problem Sensitivity	53	3	68
Category Flexibility	51	3	53
Inductive Reasoning	51	1	62

Upgrade These Skills

Skill	Level	Gap	Impt
Science	67	38	72
Troubleshooting	80	21	81
Active Listening	74	17	75
Active Learning	79	16	79
Reading Comprehension	83	14	87
Complex Problem Solving	76	14	81
Equipment Selection	76	13	80
Mathematics	77	13	79
Writing	72	11	74
Coordination	76	10	79
Operations Analysis	73	9	70
Critical Thinking	72	7	79
Technology Design	68	8	69
Judgment and Decision Making	69	6	75

Knowledge to Add

Knowledge	Level	Gap	Impt
Computers and Electronics	80	19	89
Engineering and Technology	86	15	89

LEVEL and IMPT (IMPORTANCE) refer to the Target Electronics Engineers, Except Computer. GAP refers to level difference between Commercial and Industrial Designers and Electronics Engineers, Except Computer.

ASK ANALYSIS

Ability Level Comparison - Abilities with importance scores over 50

Description	Commercial and Industrial Designers	Electronics Engineers, Except Computer	Importance
Problem Sensitivity	50	53	68
Deductive Reasoning	55	62	65
Oral Comprehension	57	64	62
Written Comprehension	57	64	62
Oral Expression	57	64	62
Inductive Reasoning	50	51	62
Information Ordering	57	57	59
Speech Recognition	44	41	59
Speech Clarity	46	46	59
Visualization	51	55	56
Selective Attention	37	42	56
Category Flexibility	48	51	53
Flexibility of Closure	39	44	53
Perceptual Speed	35	46	53
Finger Dexterity	41	51	53
Visual Color Discrimination	44	48	53
Near Vision	53	46	50

Skill Level Comparison - Abilities with importance scores over 69

Description	Commercial and Industrial Designers	Electronics Engineers, Except Computer	Importance
Reading Comprehension	69	83	87
Complex Problem Solving	62	76	81
Troubleshooting	59	80	81
Equipment Selection	63	76	80
Mathematics	64	77	79
Critical Thinking	65	72	79
Active Learning	63	79	79
Coordination	66	76	79
Active Listening	57	74	75
Judgment and Decision Making	63	69	75
Writing	61	72	74
Science	29	67	72

Operations Analysis	64	73	70
Technology Design	60	68	69

Knowledge Level Comparison - Knowledge with importance scores over 69

Description	Commercial and Industrial Designers	Electronics Engineers, Except Computer	Importance
Computers and Electronics	61	80	89
Engineering and Technology	71	86	89
Design	77	72	76
Mathematics	72	68	70

Experience & Education Comparison

Related Work Experience Comparison

Description	Commercial and Industrial Designers	Electronics Engineers, Except Computer
10+ years	0%	25%
8-10 years	0%	0%
6-8 years	30%	4%
4-6 years	21%	3%
2-4 years	9%	11%
1-2 years	12%	10%
6-12 months	9%	33%
3-6 months	6%	0%
1-3 months	9%	0%
0-1 month	0%	0%
None	0%	12%

Required Education Level Comparison

Description	Commercial and Industrial Designers	Electronics Engineers, Except Computer
Doctoral	0%	0%
Professional Degree	0%	0%
Post-Masters Cert	0%	0%
Master's Degree	7%	11%
Post-Bachelor Cert	6%	1%
Bachelors	55%	71%
AA or Equiv	18%	6%
Some College	0%	0%
Post-Secondary Certificate	9%	9%
High Scool Diploma or GED	2%	0%
No HSD or GED	0%	0%

Commercial and Industrial Designers	Electronics Engineers, Except Computer
Most Common Educational/Training Requirement:	
Bachelor's degree	Bachelor's degree
Job Zone Comparison	
4 - Job Zone Four: Considerable Preparation Needed	4 - Job Zone Four: Considerable Preparation Needed
A minimum of two to four years of work-related skill, knowledge, or experience is needed for these occupations. For example, an accountant must complete four years of college and work for several years in accounting to be considered qualified.	A minimum of two to four years of work-related skill, knowledge, or experience is needed for these occupations. For example, an accountant must complete four years of college and work for several years in accounting to be considered qualified.
Most of these occupations require a four - year bachelor's degree, but some do not.	Most of these occupations require a four - year bachelor's degree, but some do not.
Employees in these occupations usually need several years of work-related experience, on-the-job training, and/or vocational training.	Employees in these occupations usually need several years of work-related experience, on-the-job training, and/or vocational training.

Tasks

Commercial and Industrial Designers

Core Tasks

Generalized Work Activities:

- Getting Information - Observing, receiving, and otherwise obtaining information from all relevant sources.
- Interacting With Computers - Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information.
- Thinking Creatively - Developing, designing, or creating new applications, ideas, relationships, systems, or products, including artistic contributions.
- Updating and Using Relevant Knowledge - Keeping up-to-date technically and applying new knowledge to your job.
- Communicating with Supervisors, Peers, or Subordinates - Providing information to supervisors, co-workers, and subordinates by telephone, in written form, e-mail, or in person.
- Identifying Objects, Actions, and Events - Identifying information by categorizing, estimating, recognizing differences or similarities, and detecting changes in circumstances or events.

Specific Tasks

Occupation Specific Tasks:

- Advise corporations on issues involving corporate image projects or problems.
- Confer with engineering, marketing, production, or sales departments, or with customers, to establish and evaluate design concepts for manufactured products.
- Coordinate the look and function of product lines.
- Design graphic material for use as ornamentation, illustration, or advertising on manufactured materials and packaging or containers.
- Develop industrial standards and regulatory guidelines.
- Develop manufacturing procedures and monitor the manufacture of their designs in a factory to improve operations and product quality.
- Direct and coordinate the fabrication of models or samples and the drafting of working drawings and specification sheets from sketches.
- Evaluate feasibility of design ideas, based on factors such as appearance, safety, function, serviceability, budget, production costs/methods, and market characteristics.

Electronics Engineers, Except Computer

Core Tasks

Generalized Work Activities:

- Interacting With Computers - Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information.
- Getting Information - Observing, receiving, and otherwise obtaining information from all relevant sources.
- Identifying Objects, Actions, and Events - Identifying information by categorizing, estimating, recognizing differences or similarities, and detecting changes in circumstances or events.
- Repairing and Maintaining Electronic Equipment - Servicing, repairing, calibrating, regulating, fine-tuning, or testing machines, devices, and equipment that operate primarily on the basis of electrical or electronic (not mechanical) principles.
- Inspecting Equipment, Structures, or Material - Inspecting equipment, structures, or materials to identify the cause of errors or other problems or defects.

Specific Tasks

Occupation Specific Tasks:

- Analyze system requirements, capacity, cost, and customer needs to determine feasibility of project and develop system plan.
- Confer with engineers, customers, vendors or others to discuss existing and potential engineering projects or products.
- Design electronic components, software, products or systems for commercial, industrial, medical, military, or scientific applications.
- Determine material and equipment needs and order supplies.
- Develop and perform operational, maintenance, and testing procedures for electronic products, components, equipment, and systems.
- Direct and coordinate activities concerned with manufacture, construction, installation, maintenance, operation, and modification of electronic equipment, products, and systems.
- Evaluate operational systems, prototypes and proposals and recommend repair or design modifications, based on factors such as environment, service, cost, and system capabilities.
- Inspect electronic equipment, instruments, products, and systems to

- Fabricate models or samples in paper, wood, glass, fabric, plastic, metal, or other materials, using hand or power tools.
- Investigate product characteristics such as the product's safety and handling qualities, its market appeal, how efficiently it can be produced, and ways of distributing, using and maintaining it.
- Modify and refine designs, using working models, to conform with customer specifications, production limitations, or changes in design trends.
- Participate in new product planning or market research, including studying the potential need for new products.
- Prepare sketches of ideas, detailed drawings, illustrations, artwork, or blueprints, using drafting instruments, paints and brushes, or computer-aided design equipment.
- Present designs and reports to customers or design committees for approval, and discuss need for modification.
- Read publications, attend showings, and study competing products and design styles and motifs to obtain perspective and generate design concepts.
- Research production specifications, costs, production materials and manufacturing methods, and provide cost estimates and itemized production requirements.
- Supervise assistants' work throughout the design process.

Detailed Tasks

Detailed Work Activities:

- analyze market conditions
- analyze project proposal to determine feasibility, cost, or time
- analyze technical data, designs, or preliminary specifications
- communicate visually or verbally
- confer with client or staff regarding theme
- confer with other departmental heads to coordinate activities
- consult with customers concerning needs
- coordinate activities of assistants
- create art from ideas
- distinguish details in graphic arts material
- draw designs, letters, or lines
- draw prototypes, plans, or maps to scale
- estimate production costs
- evaluate product design
- evaluate product quality for sales activities
- fabricate craft or art objects
- follow manufacturing methods or techniques
- identify color or balance
- identify problems or improvements

ensure conformance to specifications, safety standards, and applicable codes and regulations.

- Operate computer-assisted engineering and design software and equipment to perform engineering tasks.
- Plan and develop applications and modifications for electronic properties used in components, products, and systems, to improve technical performance.
- Plan and implement research, methodology, and procedures to apply principles of electronic theory to engineering projects.
- Prepare documentation containing information such as confidential descriptions and specifications of proprietary hardware and software, product development and introduction schedules, product costs, and information about product performance weaknesses.
- Prepare engineering sketches and specifications for construction, relocation, and installation of equipment, facilities, products, and systems.
- Prepare necessary criteria, procedures, reports, and plans for successful conduct of the project with consideration given to site preparation, facility validation, installation, quality assurance and testing.
- Prepare, review, and maintain maintenance schedules, design documentation and operational reports and charts.
- Provide technical support and instruction to staff or customers regarding equipment standards, assisting with specific, difficult in-service engineering.
- Represent employer at conferences, meetings, boards, panels, committees, and working groups to present, explain, and defend findings and recommendations, negotiate compromises and agreements and exchange information.
- Review and evaluate work of others, inside and outside the organization, to ensure effectiveness, technical adequacy and compatibility in the resolution of complex engineering problems.
- Review or prepare budget and cost estimates for equipment, construction, and installation projects, and control expenditures.

Detailed Tasks

Detailed Work Activities:

- advise clients or customers
- advise clients regarding engineering problems
- analyze engineering design problems
- analyze engineering problems in electronics manufacturing
- analyze engineering test data

- maintain consistent production quality
- make presentations
- organize commercial artistic or design projects
- prepare artwork for camera or press
- read blueprints
- recommend improvements to work methods or procedures
- recommend solutions of administrative problems
- schedule work to meet deadlines
- sketch or draw subjects or items
- understand artistic crafts production methods
- use characteristics of graphic design materials
- use computer aided drafting or design software for design, drafting, modeling, or other engineering tasks
- use computer graphics design software
- use computers to enter, access or retrieve data
- use creativity in graphics
- use creativity in industrial artistry
- use creativity to art or design work
- use drafting or mechanical drawing techniques
- use graphic arts techniques
- use hand or power tools
- use marketing techniques
- use product knowledge to market goods

Technology - Examples

Computer aided design CAD software

- Ashlar-Vellum Cobalt
- Autodesk AliasStudio
- Autodesk AutoCAD software
- Autodesk Maya software
- Dassault Systemes CATIA software
- PTC Pro/ENGINEER software
- Siemens PLM Software UGS NX
- SolidWorks CAD software

Data base user interface and query software

- Microsoft Access

Desktop publishing software

- Adobe Systems Adobe InDesign
- Microsoft Publisher

- analyze project proposal to determine feasibility, cost, or time
- analyze scientific research data or investigative findings
- analyze technical data, designs, or preliminary specifications
- analyze test data
- assign work to staff or employees
- calculate differential equations
- calculate engineering specifications
- collect scientific or technical data
- communicate technical information
- compile numerical or statistical data
- compute production, construction, or installation specifications
- confer with engineering, technical or manufacturing personnel
- confer with research personnel
- confer with vendors
- coordinate engineering project activities
- coordinate manufacture of electrical or electronic equipment
- coordinate production maintenance activities
- create mathematical or statistical diagrams or charts
- delegate authority for engineering activities
- design control systems
- design electro-mechanical equipment
- design electronic equipment
- design engineered systems
- design manufacturing processes or methods
- design telecommunication equipment
- design transmission equipment
- design waste recovery methods
- determine factors affecting production processes
- determine specifications
- develop budgets
- develop maintenance schedules
- develop or maintain databases
- develop plans for programs or projects
- develop policies, procedures, methods, or standards
- develop tables depicting data
- direct and coordinate activities of workers or staff
- direct and coordinate scientific research or investigative studies
- direct personnel in support of engineering activities
- draw prototypes, plans, or maps to scale

- QuarkXpress

Document management software

- Adobe Systems Adobe Acrobat software

Electronic mail software

- Email software

Graphics or photo imaging software

- Adobe Systems Adobe FreeHand
- Adobe Systems Adobe Illustrator
- Adobe Systems Adobe Photoshop software
- Corel CorelDraw Graphics Suite
- Corel Painter
- McNeel Rhino software
- Xara Xtreme

Internet browser software

- Web browser software

Office suite software

- Microsoft Office

Presentation software

- Microsoft PowerPoint

Spreadsheet software

- Microsoft Excel

Video creation and editing software

- Autodesk 3ds Max
- Chaos Group V-Ray
- MAXON CINEMA 4D
- Softimage XSI

Word processing software

- Microsoft Word

Tools - Examples

- Desktop computers
- Compact digital cameras
- Universal serial bus USB flash drives
- Liquid crystal display LCD video projectors
- Laptop computers
- Personal computers

- estimate cost for engineering projects
- estimate materials or labor requirements
- estimate time needed for project
- evaluate costs of engineering projects
- evaluate engineering data
- evaluate manufacturing or processing systems
- evaluate product design
- examine engineering documents for completeness or accuracy
- explain complex mathematical information
- follow confidentiality procedures
- follow manufacturing methods or techniques
- follow safe waste disposal procedures
- follow statistical process control procedures
- improve test devices or techniques in manufacturing, industrial or engineering setting
- inspect facilities or equipment for regulatory compliance
- inspect products or systems for regulatory compliance
- lead teams in engineering projects
- order or purchase supplies, materials, or equipment
- plan scientific research or investigative studies
- plan testing of engineering methods
- prepare reports
- prepare technical reports or related documentation
- provide analytical assessment of engineering data
- read blueprints
- read manufacturing outlines for electronic products
- read schematics
- read technical drawings
- resolve engineering or science problems
- supervise production workers
- supervise quality control workers
- test equipment as part of engineering projects or processes
- understand detailed electronic design specifications
- understand engineering data or reports
- use computer aided drafting or design software for design, drafting, modeling, or other engineering tasks
- use computers to enter, access or retrieve data
- use drafting or mechanical drawing techniques
- use electrical or electronic test devices or

- use electrical or electronic test devices or equipment
- use government regulations
- use hazardous materials information
- use intuitive judgment for engineering analyses
- use knowledge of investigation techniques
- use knowledge of laser technology
- use library or online Internet research techniques
- use long or short term production planning techniques
- use machining operations with semiconductor chip forming technology
- use mathematical or statistical methods to identify or analyze problems
- use pollution control techniques
- use project management techniques
- use quality assurance techniques
- use quantitative research methods
- use relational database software
- use research methodology procedures within manufacturing or commerce
- use robotics systems technology
- use scientific research methodology
- use spreadsheet software
- use technical information in manufacturing or industrial activities
- use technical regulations for engineering problems
- use total quality management practices
- use word processing or desktop publishing software
- work as a team member
- write business project or bid proposals
- write product performance requirements

Technology - Examples
Analytical or scientific software
• Ansoft Simplorer
• Synopsys Saber
• The Mathworks MATLAB
• The MathWorks Simulink
Compiler and decompiler software
• Rabbit Semiconductor Dynamic C
Computer aided design CAD software
• Autodesk AutoCAD software
• Mathsoft Mathcad
• Mentor Graphics PADS

• MicroSim Pspice
• OrCAD Capture
• PTC Pro/ENGINEER software
• SolidWorks CAD software
• Three-dimensional 3D computer aided design CAD software
• Two-dimensional 2D computer aided design CAD software
• Xilinx Integrated Software Environment ISE
Data base management system software
• Oracle DBMS
Development environment software
• Assembler
• C
• Extensible markup language XML
• Formula translation/translator FORTRAN
• National Instruments LabVIEW
• Verilog
• Very high-speed integrated circuit VHSIC hardware description language VHDL
• Visual Numerics PV-WAVE
Electronic mail software
• IBM Lotus Notes
Enterprise resource planning ERP software
• Agile Product Lifecyle Management PLM
Graphics or photo imaging software
• Graphics software
Internet browser software
• Web browser software
Object or component oriented development software
• C++
• Microsoft Visual Basic.NET
• Microsoft Visual C# .NET
Office suite software
• Microsoft Office
Operating system software
• Hewlett-Packard HP OpenVMS

• Real time operating system RTOS software
Project management software
• McCabe Software TRUEtrack
Spreadsheet software
• Microsoft Excel
Tools - Examples
• Electronics counters
• Desktop computers
• Inductance capacitance resistance LCR meters
• Electronics probes
• Logic analyzers
• High-power pulsed lasers
• Wave meters
• Programmable logic controllers PLC
• Microprocessors
• Multimeters
• Communication bus analyzers
• Oscilloscopes
• Personal computers
• Photometers
• Function generators
• Watt meters

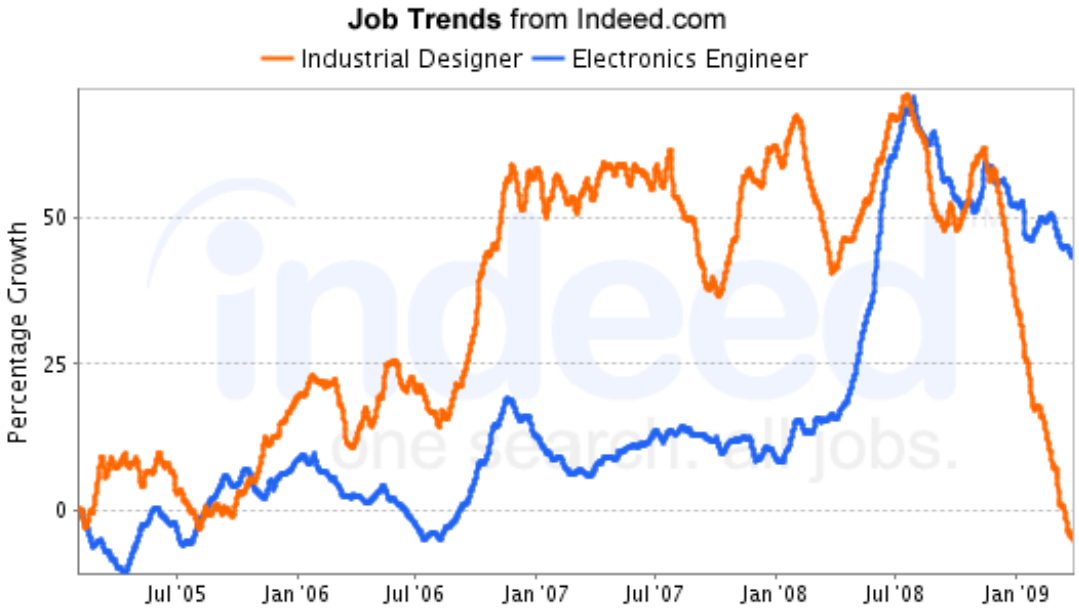
Labor Market Comparison

Description	Commercial and Industrial Designers	Electronics Engineers, Except Computer	Difference
Median Wage	$ 49,170	$ 76,420	$ 27,250
10th Percentile Wage	$ 29,790	$ 51,070	$ 21,280
25th Percentile Wage	N/A	N/A	N/A
75th Percentile Wage	$ 72,210	$ 93,570	$ 21,360
90th Percentile Wage	$ 81,030	$111,680	$ 30,650
Mean Wage	$ 53,870	$ 78,410	$ 24,540
Total Employment - 2007	140	210	70
Employment Base - 2006	153	191	38

Projected Employment - 2016	160	142	-18
Projected Job Growth - 2006-2016	4.6 %	-25.7 %	-30.2 %
Projected Annual Openings - 2006-2016	5	4	-1

National Job Posting Trends

Trend for Commercial and Industrial Designers	Trend for Electronics Engineers, Except Computer



Data from Indeed

Recommended Programs

Electrical, Electronics and Communication Engineer

Electrical, Electronics and Communications Engineering. A program that prepares individuals to apply mathematical and scientific principles to the design, development and operational evaluation of electrical, electronic and related communications systems and their components, including electrical power generation systems; and the analysis of problems such as superconductor, wave propagation, energy storage and retrieval, and reception and amplification.

Institution	Address	City	URL
University of Maine		Orono	www.umaine.edu/
University of Maine		Orono	www.umaine.edu/
University of Maine		Orono	www.umaine.edu/
University of Maine		Orono	www.umaine.edu/
University of Southern Maine	96 Falmouth St	Portland	www.usm.maine.edu

Maine Statewide Promotion Opportunities for Commercial and Industrial Designers

O*NET Code	Title	Grand TORQ	Job Zone	Employment	Median Wage	Difference	Growth	Annual Job Openings
27-1021.00	Commercial and Industrial Designers	100	4	140	$49,170.00	$0.00	5%	5
17-3026.00	Industrial Engineering Technicians	87	3	370	$51,700.00	$2,530.00	6%	9
17-2072.00	Electronics Engineers, Except Computer	87	4	210	$76,420.00	$27,250.00	-26%	4
17-2112.00	Industrial Engineers	87	4	580	$68,350.00	$19,180.00	11%	22
27-1022.00	Fashion Designers	87	3	60	$71,370.00	$22,200.00	19%	1
17-2121.02	Marine Architects	86	4	60	$75,520.00	$26,350.00	-9%	1
17-2111.03	Product Safety Engineers	85	5	90	$49,940.00	$770.00	3%	3
17-2131.00	Materials Engineers	85	4	40	$70,250.00	$21,080.00	-7%	1
11-9041.00	Engineering Managers	84	5	720	$91,030.00	$41,860.00	-2%	14
17-2071.00	Electrical Engineers	84	4	260	$73,050.00	$23,880.00	-10%	6
15-1051.00	Computer Systems Analysts	84	4	1,650	$69,340.00	$20,170.00	20%	78
17-2141.00	Mechanical Engineers	84	4	620	$67,210.00	$18,040.00	-9%	14
27-1011.00	Art Directors	83	4	90	$66,570.00	$17,400.00	10%	7
17-2111.02	Fire-Prevention and Protection Engineers	83	4	90	$49,940.00	$770.00	3%	3
15-1061.00	Database Administrators	82	4	300	$60,260.00	$11,090.00	20%	11

Top Industries for Electronics Engineers, Except Computer

Industry	NAICS	% in Industry	Employment	Projected Employment	% Change
Federal government, excluding postal service	919999	13.31%	18,348	17,345	-5.47%
Semiconductor and other electronic component manufacturing	334400	13.07%	18,014	15,746	-12.59%
Wired telecommunications carriers	517100	9.25%	12,747	11,008	-13.64%

Navigational, measuring, electromedical, and control instruments manufacturing	334500	6.89%	9,504	9,099	-4.26%
Research and development in the physical, engineering, and life sciences	541710	6.32%	8,717	9,300	6.69%
Management of companies and enterprises	551100	3.73%	5,140	5,925	15.28%
Communications equipment manufacturing	334200	3.35%	4,623	4,660	0.79%
Wireless telecommunications carriers (except satellite)	517200	3.20%	4,406	5,996	36.08%
Electrical and electronic goods merchant wholesalers	423600	3.16%	4,362	5,143	17.90%
Computer systems design and related services	541500	3.12%	4,301	5,807	35.02%
Telecommunications resellers	517300	2.28%	3,144	3,212	2.15%
Computer and peripheral equipment manufacturing	334100	2.20%	3,027	1,982	-34.54%
Management, scientific, and technical consulting services	541600	2.02%	2,784	4,970	78.52%
Self-employed workers, primary job	000601	1.76%	2,421	2,579	6.54%
Wholesale electronic markets and agents and brokers	425100	1.47%	2,031	2,304	13.48%

Top Industries for Commercial and Industrial Designers

Industry	NAICS	% in Industry	Employment	Projected Employment	% Change
Self-employed workers, primary job	000601	25.29%	12,136	12,929	6.54%
Specialized design services	541400	8.84%	4,243	5,678	33.81%
Management of companies and enterprises	551100	5.03%	2,414	2,783	15.28%
Self-employed workers, secondary job	000602	4.50%	2,158	2,148	-0.45%
Motor vehicle parts manufacturing	336300	2.70%	1,296	1,032	-20.39%
Employment services	561300	2.16%	1,038	1,314	26.56%
Plastics product manufacturing	326100	1.90%	910	965	6.00%
Miscellaneous durable goods merchant wholesalers	423900	1.40%	674	774	14.80%
Advertising and related services	541800	1.37%	657	741	12.83%
Navigational, measuring, electromedical, and control instruments manufacturing	334500	1.13%	541	518	-4.26%
Research and development in the physical, engineering, and life sciences	541710	1.11%	533	569	6.69%
Other general purpose machinery manufacturing	333900	0.94%	452	408	-9.73%
Medical equipment and supplies manufacturing	339100	0.91%	437	447	2.29%
Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	333400	0.90%	430	396	-8.01%

Household appliance manufacturing	335200	0.86%	410	311	-24.33%